

XVIII.—Some Parasitic Worms from Sarawak. By H. A. BAYLIS, M.A., D.SC.

(Published by permission of the Trustees of the British Museum.)

The following report deals with a collection of parasitic Nematodes and Cestodes made recently in Sarawak by Dr. Eric Mjöberg, late Curator of the Sarawak Museum, Kuching, and kindly submitted by him to the writer for determination.

The material included eleven species of Nematoda and nine of Cestoda. Of the Nematodes, one species was represented only by a headless fragment, and was indeterminable. One of the Cestodes, a species of *Railletina* from a Barbet, *Cyanops pulcherrima*, was also in rather poor and fragmentary condition, and has not been more precisely determined. Of the remainder, at least one Nematode and three Cestodes are believed to be new species, and one of the Cestodes seems to represent a new genus of considerable interest. Several of the other species represented in the collection are very little-known forms, and advantage has been taken of the opportunity to supplement the existing descriptions of *Subulura perarmata*, *Streptopharagus pigmentatus* and *Oesophagostomum ovatum*.

Some of the hosts are rare or little-known animals, and it is of particular interest to have obtained material from the Bornean *Mydaus*, a badger-like animal which is related to *M. javanensis* from Java and Sumatra.

Syntypes of the new species will be deposited in the British Museum (Natural History) and in the Sarawak Museum, Kuching. I also refer in the following to some odd finds from other parts of Sarawak.

NEMATODA.

SUPERFAMILY ASCAROIDAE.

FAMILY ASCARIDAE.

Two specimens—one fragmentary and both immature—of an Ascarid of doubtful determination, apparently belonging to the subfamily Ascarinae, were taken from the muscles of a tree-shrew, *Tupaia montana*. Locality : Mt. Dulit.

FAMILY HETERAKIDAE.

SUBFAMILY SUBULURINAE.

SUBULURA Molin, 1860.

SUBULURA PERARMATA Ratzel, 1868.

(Figs. 1—3).

Heterakis perarmata Ratzel, 1868, p. 150, pl. iv, figs. 8—11.

Subulura (?) *perarmata* Travassos, 1913, p. 298.

Subulura (?) *perarmata* Railliet & Henry, 1914, p. 680.

Host : *Tarsius spectrum*. Position : caecum. Locality : Kuching.

The inclusion in the collection of a number of well-preserved specimens of this species makes it possible to add a few details to Ratzel's original description, which appears to be the only one at present available. The dimensions of the male, according to Ratzel, were 6--7 mm. in length and 0.2 mm. in thickness, and those of female 8--10 mm. and 0.4 mm. respectively. The males among the present material attain a length of 11 mm. and a maximum thickness of 0.33 mm., while the females measure up to 14 mm. in length and 0.35 mm. in thickness. The distance from the anterior extremity to the end of the oesophagus, including the bulb, is 1.5--1.75 mm. The cylindrical portion of the oesophagus swells into a club posteriorly, and is joined by a narrow neck to the bulb,

which measures 0.22--0.25 mm. in length and 0.23--0.24 mm. in width. There are broad lateral cervical alae, beginning immediately behind the mouth and extending to a point a little behind the oesophageal bulb. The diameter of the head is about 0.07 mm. The nerve-ring is situated at 0.3--0.35 mm., and the excretory pore at 0.5--0.55 mm. from the anterior end in both sexes. The cuticular striations are very fine and faint, but more conspicuous on the cervical alae.

The structure of the buccal cavity, which is barely indicated in Ratzel's figures, is very curious. The cavity is about 0.08 mm. in length, and is divided into an anterior portion of 0.02 mm., with

fairly thick cuticular walls, and a much longer posterior portion, the walls of which are much thicker and darker in colour, and end in front in a serrated edge. This portion of the cavity increases slightly in width from before backwards. At its base, springing from the cuticular lining of the anterior portion of

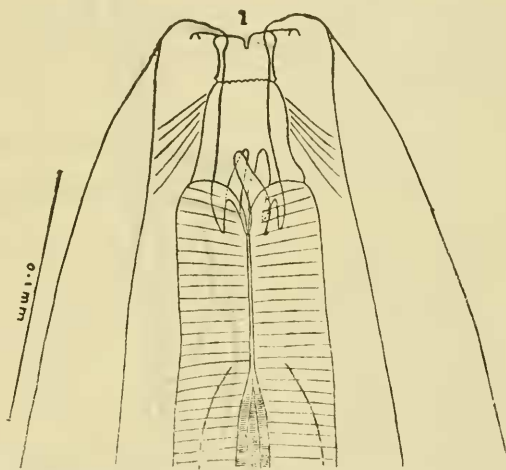


Fig. 1. *Subulura perarmata*. Head of male; dorsal view.

the oesophagus, are the three large and three small tooth-like structures described by Ratzel. The larger teeth are apparently flattened and blade-like, and the smaller teeth alternate with them.

The tail is tapering and drawn out to a fine point in both sexes. In the male it measures about 0.25 mm. in length.

There are no caudal alae. The preanal sucker is situated at about 0.5 mm. from the cloacal aperture, not from the tip of the tail, as stated by Ratzel. The spicules measure about 2.75 mm. in length, and invariably show the remarkable

twisted condition described by Ratzel. The spicules are alate, and almost the whole spicule is twisted in gimlet fashion about its longitudinal axis, the only part not involved being a short portion near the root. Ratzel suggested that this twisting of the spicules might be, at least in part, due to long immersion in alcohol, and was not inclined to lay much stress upon it as a specific character. There seems, however,

to be no reason for believing that it is not a normal and constant character of the species. The accessory piece (figs. 2, a.p., 3) is, as Ratzel states, 0.15 mm. long, and is shaped much as his figures indicate, though these are somewhat diagrammatic. The organ is largely hollow, having a large opening near its broad anterior end, on the dorsal side. The anterior edges of this aperture are produced laterally into blunt

angles, and from each of these a small flange is reflected dorsally and posteriorly, giving the anterior end of the organ a hooked appearance in lateral view. The caudal papillae were not described by Ratzel. Of these there are ten pairs, fig. 2, the third pair from the tip of the tail being some-

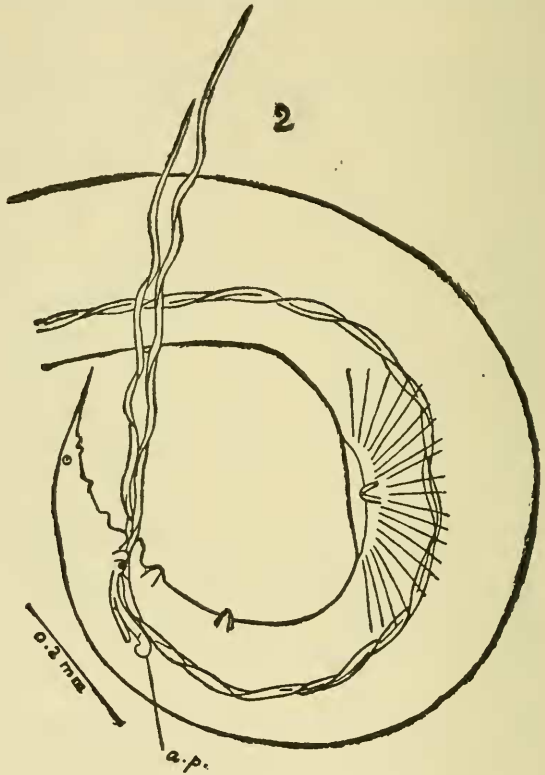


Fig. 2. *Subulura perarmata*. Caudal end of male; lateral view. a.p., accessory piece.

what laterally situated, as are also two pairs at about the level of the cloaca, the rest being subventral. The number and arrangement of the papillae are precisely as in *S. otolieni* (van Beneden), though in other respects the species are very distinct.

The tail of the female is 0.65--0.8 mm. long. The vulva, which was not observed by Ratzel, lies rather in front of the middle of the body (at about 8.2 mm. from the posterior end in a specimen 14 mm. long). The short muscular ovijector runs forward at first from the vulva, but bends sharply back upon itself, ending in an oval chamber like that described by Seurat, in certain allied species, as the glandular portion of the

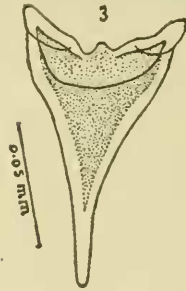


Fig. 3. *Subulura perarmata*. Accessory piece of male; dorsal view.

“sphincter.” The eggs are roundish-oval in shape and measure from 0.065 x 0.052 mm. to 0.085 x 0.067 mm.

SUBULURA sp.

A species of *Subulura*, represented by females only, was taken from *Rattus sabanus* at Mt. Dulit, together with *Protospirura muris*. Of the three specimens only one is complete. This measures some 25 mm. in length. The buccal cavity has the lining thickened in its anterior portion, and there are three large, irregularly-shaped teeth at the base. The tail is 1.3--1.5 mm. long, and tapers to a very slender termination. The eggs measure about 0.072--0.08 mm. x 0.058 mm. The species would probably be assigned to *Allodapa* by those authorities who consider that there are sufficient grounds for the separation of *Allodapa*, as a genus, from *Subulura*. It appears impossible to refer the material definitely to any of the species of *Subulura* or *Allodapa* recorded from rodents, though in measurements it closely resembles *S. pigmentata*, Gedeoelst, 1917, which occurs in *Sciurus pre-vesti* in Sumatra.

SUPERFAMILY SPIRUROIDEA.

FAMILY SPIRURIDAE.

SUBFAMILY SPIRURINAE.

PROTOSPIRURA Seurat, 1914.

PROTOSPIRURA MURIS Gmelin, 1790.

This species, which is common in rats and mice in many parts of the world, is represented by a number of specimens from the stomach of *Rattus sabanus*. Locality: Mt. Dulit.

SUBFAMILY ARDUENNINAE.

ARDUENNA Railliet and Henry, 1911.

ARDUENNA DENTATA v. Linst., 1904.

Spiroptera dentata von Linstow, 1904, p. 282, pl. i, figs. 5--7.

Arduenna dentata Railliet and Henry, 1911, p. 696.

The collection contains several female specimens which are referred to this species, from the stomach of *Sus barbatus* at Mt. Murud. Unfortunately, there is no male, and the determination cannot be confirmed by reference to the important characters of the male sex. *A. dentata* was originally recorded from *Sus cristatus* in Ceylon, and specimens found in domestic pigs in Cochin-China have been referred to the same species.

STREPTOPHARAGUS Blanc, 1912.

STREPTOPHARAGUS PIGMENTATUS v. Linst., 1897.

Spiroptera pigmentata von Linstow, 1897, p. 604, pl. xxviii, figs. 1--5.

Streptopharagus pigmentatus Railliet and Henry, 1918, p. 84.

Host: *Hylobates mulleri*. Locality: Mt. Murud.

The specimens, according to the label, were found in the abdominal cavity of the host. It is probable, however, that they had wandered into that position from the stomach after the animal's death. The species was recorded by von Linstow from *Cercopithecus albogularis* (an African monkey), and by Railliet and Henry from *Macaca* sp. from the Belgian Congo, but does not seem to have been recorded from Gibbons, and its occurrence in Borneo is interesting.

The present material, reasonable allowance being made for variation in measurements, agrees well, on the whole, with the description given by von Linstow. The masses of "pigment" mentioned by him as being abundant in the cuticle are not visible in these specimens, and it seems probable that they were artifacts caused by some reagent in which von Linstow's

material had been placed. A single cervical ala is present, on the left side, but it is narrow and feebly-developed as compared with that of the genotype, *S. armatus*. The tail of the male has a preanal row of claw-like cuticular structures, arranged in a horseshoe, with the arms of the horseshoe directed posteriorly but not extending behind the anus. These structures are less prominent than in *S. armatus*, being apparently cuticular papillae of the same kind as those covering the general ventral surface of the caudal region, but more highly developed. The writer (1923) has given a summary of the characters of the known species of this genus, and it was there remarked that von Linstow describes and figures five pairs of preanal papillae in the male of *S. pigmentatus*. The fifth pair, close to the anus, though counted in von Linstow's text as one of the pairs of stalked papillae, is figured as sessile. This pair of papillae, which does not appear to exist in other species of the genus, has not been in the material now under discussion, and it may perhaps be doubted whether it was present in von Linstow's specimens.

SUBFAMILY PHYSALOPTERINAE.

PHYSALOPTERA Rudolphi, 1819.

PHYSALOPTERA MYDAI, sp. n. (Figs. 4—6).

Host : *Mydaus* sp. (Bornean badger). Position : stomach.
Locality : Kalabit country.

This is a stoutish form much resembling the genotype, *P. clausa*, in general appearance. The largest male and female measure roughly 30 mm. and 50 mm. in length respectively, with maximum thickness of about 1.2 mm. and 2 mm. or a little over. The distance from the anterior extremity of the head to the posterior end of the oesophagus is 5-6.4 mm., and from the same point to the end of the narrower anterior portion of the oesophagus 0.85-0.9 mm. The cervical papillae are situated at 0.7 mm., the nerve-ring at 0.6 mm., and the excretory pore at 0.85-0.9 mm., from the anterior end. The cuticle is transversely striated at intervals of about 0.002 mm. in the male and 0.004 mm. in the female. In addition to the striations there is a tendency for the cuticle to exhibit many deep transverse wrinkles. The lips are large, rounded externally and obtuse in front. The external surface

of each lip bears three papillae; a small median, lateral papilla which scarcely breaks the surface of the cuticle,* and

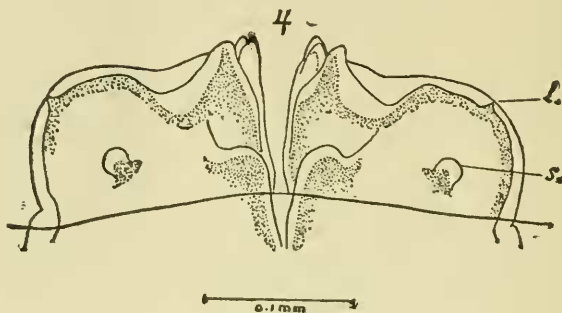


Fig. 4. *Physaloptera mydai*. Head of female; dorsal view. *l*, lateral papilla; *s*, subdorsal papilla.

prominent, dome-shaped subdorsal and subventral papillae. The usual teeth are present on a median prominence at the extremity of the lip—a blunt external tooth and a tripartite internal tooth, the median cusp of which is slightly smaller than the others. At the base of the median prominence

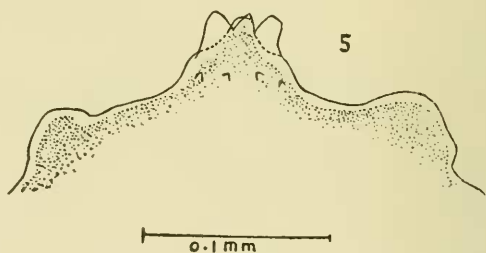


Fig. 5. *Physaloptera mydai*. Lip of female, viewed from inner surface.

there are two pairs of small refringent points, possibly denticles. Towards the dorsal and ventral sides of the dentigerous surface there are also two large, prominent, rounded processes, which can hardly be described as teeth. On the ridges connecting these with the median prominence there may be several small

* Ortlepp (1922) doubts the presence of a lateral papilla in *Physaloptera*. It is a very remarkable fact if this papilla is really absent in most species of *Physaloptera*, since in all other Nematodes with two lateral lips, in which it has been carefully looked for, such a papilla has invariably been found.

rounded papilliform cuticular structures, possibly representing the denticles found in some species of *Physaloptera*, but these are not constant, and no true denticles have been observed.

The tail of the male is 1.7 mm. in length. The caudal end (fig. 6) is provided with very strongly developed lateral alae, forming a "bursa" of the type usual in the genus, and continuous across the ventral surface some distance in front of the anus. The "bursa" is voluminous, vesicular and much folded. Its ventral surface is provided with the usual longitudinal rows of papilliform cuticular processes. In the mid-ventral region these processes are simple and button-like,

but in the more lateral rows they become gradually more elongated, sharp and claw-like. The "bursa" is somewhat asymmetrical, the lateral ala of the right side extending anteriorly somewhat further than that of the left. The usual four pairs of long-stalked lateral papillae are present. Immediately behind the most posterior of these, and a little nearer to the mid-ventral line, is another pair of papillae with moderately long peduncles. About midway

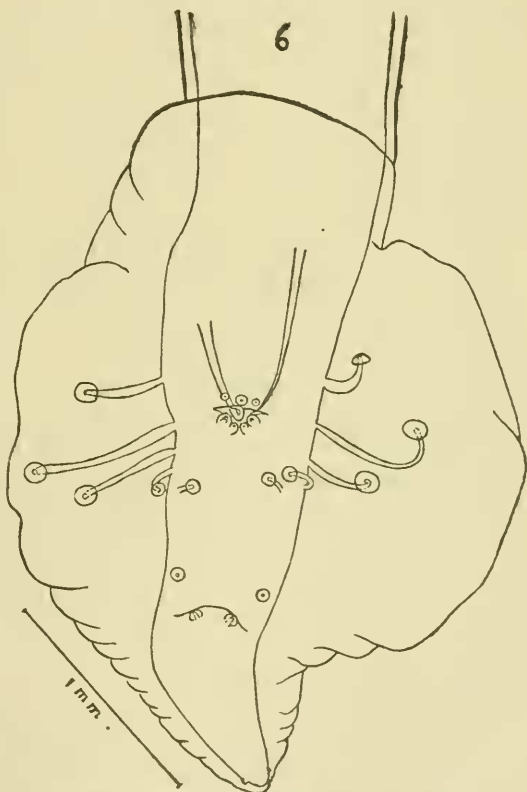


Fig. 6. *Physaloptera mydai*. Caudal end of male; ventral view.

between these and the tip of the tail there are two pairs of sessile subventral papillae, of which the more posterior is

situated on a slight elevation of the cuticle. Near the tip of the tail there is a pair of very minute sublateral papillae. On the anterior lip of the cloaca there is a row of three sessile papillae, that in the middle being slightly larger than the others. On the posterior lip there are two pairs of papillae, the pair nearer to the middle line being slightly smaller than the other. The spicules are subequal, the left measuring 0.85--0.9 mm. in length, the right 0.7--0.8 mm. The right spicule is slightly stouter than the left.

The tail of the female is extremely short (not more than 0.7 mm.) and is very blunt and rounded. The vulva is situated some distance (as much as 5 mm. in some specimens) behind the posterior end of the oesophagus. The vagina runs, on the whole, forward from the vulva, gradually widening into a fusiform egg-chamber which may be bent upon itself. This gives off two narrow tubes which continue to run forward into the oesophageal region, there enlarging into two rather wide uterine branches which turn and run almost straight posteriorly. The eggs measure about 0.06 x 0.035 mm.

FAMILY GNATHOSTOMIDAE.

SUBFAMILY GNATHOSTOMINAE.

TANQUA Blanchard, 1904.

TANQUA TIARA v. Linst., 1879.

Ascaris tiara von Linstow, 1879, p. 320.

Tanqua tiara Blanchard, 1904, p. 478.

(For full synonymy and description see Baylis and Lane, 1920, p. 259.)

This species, which is abundant in Monitors wherever they occur, was taken from *Varanus salvator* at Kuching.

SUPERFAMILY STRONGYLOIDEA.

FAMILY STRONGYLIDAE.

SUBFAMILY STRONGYLINAE.

OESOPHAGOSTOMUM Molin, 1861.

OESOPHAGOSTOMUM OVATUM v. Linst., in Smidt, 1906.

Strongylus ovatus von Linstow, in Smidt, 1906, p. 646, figs. 1--4.

Oesophagostomum ovatum Railliet and Henry, 1912, p. 572, footnote.

A single male specimen which is referred provisionally to this species was collected, in company with *Streptopharagus pigmentatus*, from *Hylobates mulleri* at Mt. Murud. The species was originally recorded by Smidt from *Hylobates syndactylus* and *H. agilis* in Sumatra. It is very inadequately

described, from immature material, and Ihle (1912) has suggested that it is perhaps identical with *O. apiostomum* Willach. From the data obtainable from the present specimen, however, this would seem not to be the case. This individual has a length of about 17 mm. and a maximum thickness of 0.7 mm., as against 10--2.8 mm. and 0.425--0.565 mm. respectively in the males of *O. apiostomum*, according to Ihle. The cuticular striations are 0.02 mm. apart (0.016--0.017 mm. in male *apiostomum*). The cervical groove is at 0.45 mm. from the anterior end (0.262--0.27 mm. in male *apiostomum*). The mouth-capsule is quite different in shape from that of *O. apiostomum* as described by Ihle, being very wide (0.14 mm. in outside diameter), with walls that are more or less lenticular in optical section, and 0.037 mm. in length. In *apiostomum*, according to Ihle, the capsule measures 0.06--0.082 mm. in width and 0.02--0.021 mm. in length. Three slender, pointed and slightly recurved teeth, one dorsal and two subventral, are present near the anterior end of the oesophageal funnel, resembling those of *O. brumpti* as figured by Railliet and Henry (1912), rather than the "pointed nodules" described by Ihle in *O. apiostomum*. The number of elements in the external leaf-crown unfortunately cannot be made out with certainty, owing to the mouth being full of débris. The oesophagus measures 0.94 mm. in length (as against 0.615 mm. in the male of *apiostomum*), and has a maximum thickness of 0.2 mm. (0.17 mm. in *apiostomum*). There is nothing worthy of remark in the form of the bursa or in the arrangement of its rays, which seems to be identical with that of *apiostomum*. The spicules measure about 2 mm. in length. (In *apiostomum* they are only 1.25--1.35 mm. long.)

Of the seven other species of *Oesophagostomum* recorded from Primates, besides *O. apiostomum* and *O. ovatum*, several have only been very briefly described, and only two, *O. brumpti* Railliet and Henry and *O. stephanostomum* Stossich, are at all well known. In *O. brumpti* the male measures only 6.7--11 mm. in length, and the spicules are only 0.9--1.08 mm. long. In *O. stephanostomum*, according to Railliet and Henry (1912), the male is of about the same size as the specimen here under discussion (17--22 mm. long), but the spicules measure only 1.38--1.475 mm., the cervical groove is considerably nearer (0.36--0.365 mm.) to the anterior end, and the buccal capsule is much shorter (0.022 mm.). *O. blanchardi* Railliet and Henry (1912, p. 572, footnote); from the Orang-

utan in Borneo, is said to have 16 elements in the leaf-crown, and spicules measuring up to 1.825 mm. in length, but is not further described, so that it is impossible to say whether it is distinct from *O. ovatum*.

SUBFAMILY DELETROCEPHALINAE.

DIAPHANOCEPHALUS Diesing, 1851.

DIAPHANOCEPHALUS sp.

A single female of a species of *Diaphanocephalus* was taken, together with *Tanqua tiara*, from *Varanus salvator* at Kuching.

CESTODA.

PSEUDOPHYLLIDEA.

FAMILY BOTHRIOCEPHALIDAE.

DUTHIERSIA Perrier, 1873.

DUTHIERSIA EXPANSA Perrier 1873.

Perrier, 1873, p. 359, pl. xvi, figs. 1-4.
Beddard, 1917, p. 80, figs. 2-4.

Several specimens of this curious species were collected from *Varanus salvator* at Kuching.

CYCLOPHYLLIDEA.

FAMILY ANOPLOCEPHALIDAE.

SUBFAMILY ANOPLOCEPHALINAE.

BERTIELLA Stiles and Hassall, 1902.

BERTIELLA ELONGATA Fuhrm., in Parona, 1900.

Taenia (Berthia) elongata Fuhrmann, in Parona, 1900, p. 5, *vide* Stiles and Hassall, *Index-Cat. Med. and Vet. Zool.*)

Bertia elongata Bourquin, 1905, p. 444, pl. viii, figs. 12-21; pl. ix, figs. 26-28.

Bertiella elongata Douthitt, 1915, p. 67.

A few specimens of this interesting species were collected from *Galeopterus temminckii** at Miri. A full description is given by Bourquin, under the heading "*Bertia elongata* Bourquin." The name *elongata* appears, however, to have been given to the species previously by Fuhrmann.

* The host is named *Galeopithecus volans* on the collector's label, but according to information kindly supplied by Mr. M. A. C. Hinton, of the British Museum (Nat. Hist.), this animal is confined to the Philippines, and the form found in Borneo is quite distinct from it.

FAMILY HYMENOLEPIDIDAE.

SUBFAMILY HYMENOLEPIDINAE.

HYMENOLEPIS Weinland, 1858.

HYMENOLEPIS LONGIOR Baylis, 1922.

Baylis, 1922, p. 2.

This species was hitherto only known from *Epimys rattus* and *E. norvegicus* in Great Britain. It is interesting to find it in a rat indigenous to Borneo, which shows that it probably has a wide geographical range.

CHITINOLEPIS nov.

CHITINOLEPIS MJÖBERGI, sp. n. (Figs. 7-8).

Host: *Rattus sabanus*. Locality: Mt. Dulit.

This species occurred together with *Railletina blanchardi*, in about equal numbers, in the large intestine of the host. The strobila attains a length of 13-17 cm., with a maximum width of about 2.5 mm. The scolex measures 0.34-0.43 mm. in width at its widest part, which is usually a little behind the suckers. There are four suckers, each somewhat raised on a squarish thickening of the scolex, and having a diameter of 0.12-0.15 mm. A rudimentary, unarmed rostellum is present, but in all the specimens examined it is completely invaginated within the scolex. In specimens in a fairly extended condition, the neck is unsegmented for a distance of about 0.7 mm. behind the scolex, and is narrower than the latter. The segments are much broader than long throughout the strobila. A strobila 13.5 cm. long contains over 1100 segments, fully mature segments beginning at about the 670th (the male organs are already functioning in more anterior segments), and gravid segments at about the 980th.

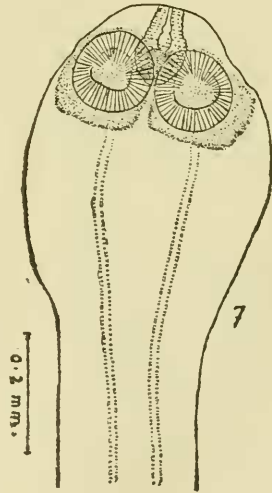


Fig. 7. *Chitinolepis mjöbergi*. Scolex; dorsal or ventral view.

The excretory system consists of the usual two pairs of longitudinal vessels, both lying in almost the same horizontal

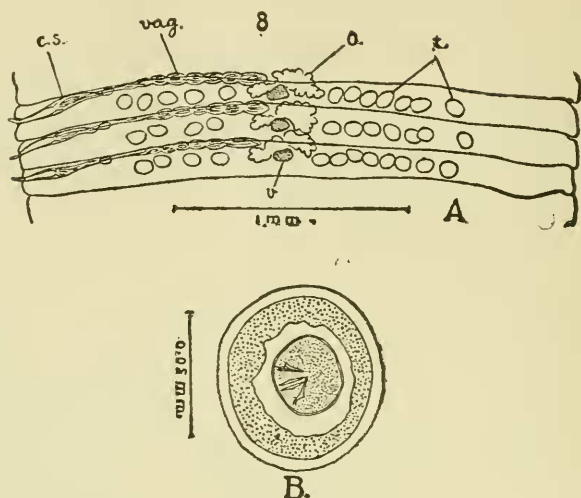


Fig. 8. *Chitinolepis mjöbergi*. A, semi-diagrammatic representation of three mature segments in ventral view, from a whole preparation; c-s, cirrus-sac; o, ovary; t, testes; v, yolk-gland; vag, vagina; B, an egg.

plane. Those which must be regarded as the ventral vessels are slightly wider than the others, and connected by narrow transverse intersegmental vessels. The genital pores are unilateral, on what appears to be the right side of the strobila. The genital ducts pass dorsally to both the longitudinal excretory vessels and to the longitudinal nerve of that side. The cirrus-sac is elongated and spindle-shaped, extending inwards a little beyond the nerve of the side. It measures 0.34-0.37 mm. in length, and has a maximum thickness of 0.40-0.06 mm., according to its state of contraction. It contains a long internal vesicula seminalis. There is also, connected with its inner end by a narrow duct, a pear-shaped external vesicula seminalis which, when full of spermatozoa, measures about 0.15 x 0.055 mm. The cylindrical cirrus is armed with minute spines. The vagina opens ventrally to the cirrus-sac.

In young mature segments it has a wide lumen, expanding somewhat towards its inner end to form a club-shaped receptaculum seminis just before reaching the female glands. In older segments almost the whole vagina serves as a receptaculum, and has a moniliform appearance owing to the inclusion of a series of spherical masses of spermatozoa.

The ovary is situated with its centre very slightly towards the pore side of the middle line. It has a transverse diameter of 0.3--0.35 mm., is deeply lobulated, and more or less clearly divided into two lateral masses, of which that on the aboral side is the larger. These masses curve posteriorly, embracing the compact yolk-gland, which lies behind the middle portion of the ovary and is transversely elongated, measuring about 0.1 x 0.06 mm. The number of testes in each segment varies between nine and twelve. These are arranged in a single row along the posterior border of the segment and between the dorsal longitudinal excretory vessels. In accordance with the position of the female glands, there are usually fewer testes (not more than six) on the pore side of the yolk-gland. The uterus persists as a transversely elongated sac with irregular walls, extending across nearly the whole width of the gravid segment. The ova have thick, finely-granulated, pale brownish outer shells measuring about 0.065 mm. in diameter. The onchosphere is closely surrounded by an inner shell measuring 0.03--0.0375 mm. in diameter. The embryonic hooks are 0.012--0.015 mm. in length. Between the two shells of the egg is a mass of finely-granular, probably albuminous, material, which sometimes gives rise to the appearance of a third shell or membrane, as in *Hymenolepis*.

The systematic position of this species is rather difficult to determine. Some of its characters are suggestive of affinities with the *Anoplocephalidae*. The presence of a rostellum, however, even though rudimentary, seems to indicate that it does not belong to that family. The only other family to which it could be referred seems to be the *Hymenolepididae*. In most of the genera included in this family the rostellum is either armed or absent. In *Hymenolepis*, however, it is sometimes present in a rudimentary and unarmed condition. Further, *Hymenolepis* and the other genera included in the subfamily *Hymenolepidinae* have invariably a persistent sac-like uterus. There appears to be no bar to the inclusion of *Chitinolepis* in this subfamily, though it could not be referred

to either of the other groups (*Dipylidiinae* and *Paruterininae*) into which the *Hymenolepididae* have been divided. The genus is therefore referred provisionally to the *Hymenolepidinae*. The exceptional thickness of the outer shell of the eggs is remarkable, and is a feature rather reminiscent of the *Taeniidae*.

SUBFAMILY DIPYLIDIINAE.

ANOMOTAENIA Cohn, 1900.

ANOMOTAENIA MURUDENSIS sp. n.

Host : *Garrular schistochlamys* (a Laughing-thrush). Locality : Mt. Murud.

The material of this species is in a somewhat unsatisfactory condition, and will only be very briefly described. The strobila is very muscular, and the specimens are much contracted. The length of the longest is about 22 mm., and the maximum width attained is about 2 mm. The scolex has a transverse diameter of 0.37-0.43 mm. The suckers measure 0.12-0.16 mm. in diameter, and the rostellum 0.12-0.19 mm. The latter bears two alternating crowns of powerful hooks, having about 20 or 22 hooks in each. The hooks measure 0.05-0.055 mm. in length. In mature segments there are 35-45 testes, grouped behind and at the sides of the female glands. The genital pores are irregularly alternating, situated near the anterior border of each segment and usually overlapped by the hinder edge of the preceding segment. The cirrus-sac measures about 0.15 x 0.05 mm. The cirrus is covered with minute spines. The gravid segments are almost entirely filled by the sac-like uterus. The onchospheres measure about 0.028 mm. in diameter and are enclosed in two thin shells.

Anomotaenia deliscens (Krabbe, 1879) appears to be the only *Anomotaenia* recorded from a bird of the family (*Timeliidae*) to which *Garrular* belongs. This is a very much smaller form, with hooks only 0.012 mm. long. The following species occur in birds more or less distantly related to the above-mentioned family, but the form here described is readily distinguished from them by the size of its hooks alone:—*Anomotaenia constricta* Molin, *A. trigonocephala* Krabbe, *A. borealis* Krabbe, *A. quadrata* Rud.

FAMILY DAVAINIIDAE.

SUBFAMILY DAVAINIINAE.

RAILLIETINA Fuhrmann, 1920.

SUBGENUS PARONIELLA Fuhrmann, 1920.

RAILLIETINA (PARONIELLA) BLANCHARDI (Parona, 1898).

Davainea blanchardi Parona, 1898, p. 2, pl. i, figs. 1--8.

This species occurred together with *Chitinolepis mjobergi* in *Rattus sabanus* at Mt. Dulit. The two forms are of much the same size and at the first glance not easy to separate. Complete specimens, however, can be distinguished by the great difference in the shape of the posterior segments, which in *R. blanchardi* ultimately become longer than broad. *R. blanchardi* was originally recorded from *Mus siporanus* and *M. rajah*.

RANSOMIA Fuhrmann, 1920.

RAILLIETINA (RANSOMIA) INSIGNIS (Steudener, 1877).

Taenia insignis Steudener, 1877, p. 298, pl. xxxi, figs. 1--7.

Davainea insignis Blanchardi, 1891, p. 434, fig. 12.

This species occurred in considerable numbers in *Ducula badia* at Mt. Murud. It has been recorded from *Globicera* [*Carpophaga*] *oceanica*, to which the present host is closely related. There are also in the British Museum specimens which probably belong to it from *Treron delandii*, from East Africa.

RAILLIETINA (RANSOMIA) CALYPTOMENAE sp. n.

Host: *Calyptomena whiteheadi* (a Broadbill). Locality: Mt. Murud.

The strobila (in the preserved material) attains a length of 6--10 cm., and a maximum width of 0.9--1.15 mm. The diameter of the scolex is 0.17--0.25 mm. The suckers measure 0.055--0.08 mm. in diameter, and are armed with minute spines. The rostellum has a diameter of 0.1--0.125 mm., and is armed with very numerous hooks, arranged in two irregularly alternating rows and measuring about 0.008 mm.

in length. The specimens are in a somewhat contracted condition, so that the neck appears short. The segments are very numerous, and for the most part are broader than long (much broader in contracted specimens). The gravid segments, however, become square, and finally, in some specimens, slightly longer than broad. The subcuticular and muscular layers are well-developed. The medullary parenchyme occupies not much more than one-third of the width of the strobila. The genital pores are unilateral (on the right side), and situated a little in front of the middle of the lateral borders of the segments. There is a small muscular genital atrium. The cirrus-sac is relatively large, measuring about 0.16 mm. in length and 0.055 mm. in greatest thickness. It curves forward from the pore, its inner end nearly reaching the anterior border of the segment. The cirrus is very muscular. The ovary is distinctly divided into two lateral masses, which form a triangle with the large yolk-gland, situated posteriorly. The testes are relatively large, apparently only five in number, immediately surrounding the female glands behind and at the sides, but more dorsal in position. The uterus, at first a sac, breaks down into egg-capsules, each of which contains about eight eggs. The capsules are confined to the space between the wide and conspicuous longitudinal excretory vessels.

This species differs from the great majority of forms in the Subgenus *Ransomia* in its small number of testes. There are, however, certain species resembling it in this respect. *R. (R.) mutabilis* Rüther has, according to Fuhrmann (1920), only one testis per segment; *cacatuina* (Johnston, 1911) has four or five; *oligorchida* (Fuhrm., 1911) has five or six; and *paucitesticulata* (Fuhrm., 1909) has six or seven. Of the three last-mentioned forms, *cacatuina* and *paucitesticulata* show a very close resemblance to the species just described, but both are evidently smaller forms, and nearly all the measurements given for them are considerably less than the corresponding figures for *R. calyptomeneae*. In *R. paucitesticulata* the rostellar hooks are larger (0.012--0.014 mm.), and the cirrus-sac considerably smaller (0.07--0.088 mm. long). In addition, it may be mentioned that *R. paucitesticulata* occurs in a pigeon, while *cacatuina* and *oligorchida* occur in Psittaciform birds. The writer is unable to find records of any Cestodes from birds of the group (Eurylaemidae) to which the present host belongs.

REFERENCES.

- Baylis, H. A., 1922. Observations on certain Cestodes of Rats, with an account of a new species of *Hymenolepis*. *Parasitol*, xvi, 1, pp. 1--8.
- 1923. On the Nematode Genus *Streptopharagus*, with some Remarks on the Genus *Spirocerca*. *Trans. Roy. Soc. Trop. Med. & Hyg.*, xvi, 8, pp. 486--487.
- Baylis, H. A., and Lane, C., 1920. A Revision of the Nematode Family Gnathostomidae. *Proc. Zool. Soc. Lond.*, pp. 245--310, pls. i--viii.
- Beddard, F. E., 1917. On the Scolex in the Cestode Genus *Duthiersia*, and on the Species of that Genus. *Proc. Zool. Soc. Lond.*, pp. 73--82.
- Blanchard, R., 1891. Notices helminthologiques (deuxième série). *Mém. Soc. Zool. France*, iv, pp. 420--489.
- 1904. *Tanqua*, n. g., remplaçant *Ctenocephalus* von Linstow. *Arch. Parasitol* Paris, viii, p. 478.
- Bourquin, J., 1905. Cestodes de Mammifères. Le Genre *Bertia*. *Rev. Suisse Zool.*, xiii, pp. 415--506, pls. vii--ix.
- Douthitt, H., 1915. Studies on the Cestode Family Anoplocephalidae. *Illinois Biol. Monogr.*, 1, 3, pp. 353--446, pls. i--vi.
- Fuhrmann, O., 1920. Considérations générales sur les *Davainea*. *Festschr. für Zschokke*, No. 27, Basel, 19 pp.
- Ihle, J. E. W., 1922. On *Oesophagostomum apioctomum* (Willach) and some Remarks on the Classification of the Strongylidae. *Bijdr. Dierk.*, Amsterdam, xxii, pp. 89--93.
- Linstow, O. von, 1879. Helminthologische Untersuchungen. *Württemb. Naturw. Jahresh.*, xxxv, pp. 313--342, pl. v.
- 1897. Zur Systematik der Nematoden nebst Beschreibung neuer Arten. *Arch. f. Mikr. Anat.*, xlix, pp. 608--622, pl. xxviii.
- 1904. Nematoda in the Collection of the Colombo Museum. *Spolia Zeylanica*, i, 4, pp. 91--104, pls. i--ii.
- Ortlepp, R. J., 1922. The Nematode Genus *Physaloptera* Rud. *Proc. Zool. Soc. Lond.*, pp. 999--1107.
- Parona, C., 1898. Elminti raccolti dal Dott. Elio Modigliani alle isole Mentawai, Engano Sumatra. *Ann. Mus. Civ. Stor. Nat.*, Genova, xxxix, pp. 102--124, pl. i.
- 1900. *Helminthum ex Conradi Paronae Museo Catalogus*. (Sect. 2, Cestodes), 6 pp, Genova.
- Perrier, E., 1873. Description d'un genre nouveau de cestoides (genre *Duthiersia*, E. P.). *Arch. Zool. exp. et gén.*, Paris, ii, pp. 349--362, pl. xvi.

Railliet, A., and Henry, A., 1911. Helminthes du Porc recueillis par M. Bauche en Annam. *Bull. Soc. Path. exot.*, Paris, iv, 10, pp. 693-699.

— 1912. Les Oesophagostomiens Parasites de l'Homme. *Arch. Parasitol.*, Paris, xiv, pp. 562-583, pls. xxii-xxiv.

— 1914. Essai des Classification des "Heterakidae." IXe. *Congrès internat. de Zool.*, Monaco, pp. 674-682.

— 1918. Nématodes parasites du Congo belge. *Bull. Soc. Path. exot.*, Paris, xi, 2, pp. 82-86.

Ratzel, F., 1868. Beschreibung einiger neuen Parasites. *Arch. f. Naturg.*, xxxiv, i, pp. 150-156, pl. iv, figs. 8-14.

Smidt, H., 1906. Ueber einen neuen, beim Gibbon gefundenen *Strongylus* (*Strongylus ovatus* v. Linstow). *Centralbl. f. Bakt. u. Parasitenk.* Abth. i, xli, 6, pp. 646-651.

Stuedener, F., 1877. Untersuchungen über den feineren Bau der Cestoden. *Abh. Naturf. Ges. Halle*, xiii, pp. 277-310, pls. xxviii-xxxii.

Travassos, L., 1913. Sobre as especies brazileiras da subfamilia Heterakinae. *Mem. Inst. Osw. Cruz*, Rio de Janeiro, v, pp. 271-318, pls. xxvii-xxxii.